

File OER

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MEMORANDUM FOR: Director, National Foreign
Assessment Center

FROM: Chief, OER Development and Analysis Center

SUBJECT: Information Handling

1. Next week the EXCOM will consider various options for information handling. The problem of choosing the right option is basically a problem of designing an economic and political system. That system will determine who gets what information services for years to come.

2. This memorandum suggests some questions that the EXCOM might want to consider before making a final decision on information services. The questions are organized in two parts. The primary issue is whether the EXCOM is looking at the right options for information handling. The second concern is whether the EXCOM will be looking at the options in the right way, using the decision-theoretic approach selected by the IHTF.

Part I: Are We Looking at the Right Options?

Question 1: How many options are there?

Background on Question 1: Suppose, for the moment, that if you are going to plan the wires of a central computer timesharing system, then you must also plan the terminals to be hooked to the system; and you must plan as well all the mini-computers and word-processors that have nothing to do with the timesharing system. This is to assume that information management is a monolithic, indivisible entity. With that handy assumption, you have greatly reduced the number of options you need to consider. In particular, you are now dealing with a binary, yes-or-no decision as to whether information services shall be planned in a new directorate.

in fact, however, different aspects of information handling can be managed at different levels in the Agency. It makes no sense whatsoever for OER to begin building its own system of world-wide communications gear, as would be the case in the IHTF's option of "component autonomy." At the same time, OER has benefited immensely from having the freedom to pick its own word-processing system. This means that there are millions of options.

From this perspective, the most critical and difficult aspect of the EXCOM's decision is the creativity necessary to find the best options. Once these have been placed on the table, the decision-theoretic task of selecting among the options is trivial.

Question 2: *Let's consider the people in the Agency who use information handling services to produce finished intelligence. What do they think of the options recommended by the IHTF?*

Background on Question 2: It appears that only one or two of the users of information services have seen the options listed by the IHTF. To be sure, the IHTF polled users for their information-handling requirements; but the IHTF alone interpreted the poll, prioritized the requirements, and wrote the options. Consequently, it is not clear that any of the options reflect the concerns of the users.

Question 3: *Let's take a second look at the options involving a top-down determination of information services. Who judges the quality of service?*

Background on Question 3: The top-down options create an almost perfect vacuum, within which the providers of information services judge the quality of their own work. This idea never worked well for the Soviet State Planning Commission, and it will not work in the Agency. A case in point: OER has been waiting years for computer terminals that ODP agreed to install. There has never been a question about the requests for the terminals themselves. Instead, ODP simply has not managed to get its act together, despite all the planning documents and other memoranda that have been written. The system does not work because the users of information services have no control over the quality of service. Even though the service has been faulty, no one in ODP has received a marginal fitness report on that account. To improve matters, we need a more decentralized system in which the users of information services have some strong, tangible controls over the quality of service, other than begging.

Question 4: What about the quality of personnel management under a centralized system of information services? How will centralization outweigh the benefits of the present system?

Background on Question 4: ADP professionals and other information specialists in the Agency can now follow any one of many career paths under different management. This is a great feature of the present system. When a talented programmer thinks that he is not being treated fairly, he can seek work elsewhere in the Agency, rather than quit. As a result, many of the Agency's very best computer scientists now work happily in different components. The various opportunities for career progress also have a beneficial effect on management: it is one thing to be careless in managing people who are totally under your thumb; but it is a different matter to manage people who can leave. In that case, you have to earn respect.

Question 5: What about technological innovation under a top-down system? To the extent that we have had central planning of ADP services, how has that worked?

Background on Question 5: The best innovations often come from the bottom up. For example, for years ODP maintained the old SCRIPT word processing system. From their perspective, it was a fine system, and indeed it probably did an admirable job of moving around the bits and bytes that were fed to it. From a user's viewpoint, however, it left much to be desired. Consequently, the NBI word-processing system in NFAC was researched and selected not by ODP, but by people who wanted a better way to produce finished intelligence. The same kind of technological progress occurred in the Credit Union, which opted for its own computer system, with no regret.

Question 6: What about the economies of scale inherent in a big, centrally-planned system of information handling? How important are they?

Background on Question 6: It is not clear that central planning involves many net economies of scale. A case in point: the Agency's new standard terminal, the Delta Data 7260, costs more than \$5,000 per unit. For many purposes, an alternative terminal priced at around \$1,000 would be more than adequate. Here we have one of the many dis-economies of scale. The problem, again, is that the users of information services have no real voice in the choice of those services.

Question 7: On balance, what new option should the EXCOM consider?

Background on Question 7: The best choice is the status quo, with a few significant modifications:

- o Rotational assignments. In each office that provides information services, either the director or the deputy director should be selected from among the people that the office is intended to serve. The assignment should be rotational, lasting about 3 years. There is an ample supply of talent to staff these rotational jobs. (One of the arguments against the Credit Union's present system was that the Credit Union employees were not sophisticated enough to run an ADP system.)

- o New career panels. Users of information services should be members of the career panels of the offices that provide the services.

- o A board of information-handling architects at the DCI level. The board would vote only on matters that cannot be resolved at lower levels in the Agency. It would function as a "weak architect" in the parlance of the IHTF report, but it would offer a balanced representation of servers and users.

This option should be entered as one of the choices to be evaluated in the IHTF exercise in computerized decision making.

Part II: Are we looking at the options in the right way?

Question 1: *In practical terms, what is the decision-making methodology that the IHTF has selected?*

Background on Question 1: The particular decision model selected by the IHTF is one of thousands that are promoted routinely by various research contractors. Essentially, it is a very simple idea that is played out on a computer. To illustrate the idea, suppose that one of your children decides to eat nothing but hotdogs. You, as an understanding parent, try to reason with the child, using scientific logic. You ask him to propose a second option, which he does--a diet of candy bars. You offer a third option of a balanced diet. These become the three decision options, which can be appropriately mystified by acronyms for the computer: HTDGS, CNDY, and OTHERSTUFF.

Next you turn to the qualities that a good diet should provide, namely proteins, calories, and vitamins. These are all about equally important, so you give each a weight of 33 on a scale of 0 to 100. (This is necessary to quantify the problem along the lines of the IHTF methodology.)

Now you take a second look at the first quality of a good diet, namely the proteins that it provides. Which of the three options--HTDGS, CNDY, and OTHERSTUFF--provides the most

proteins? The hotdogs are clearly the winner here, especially if the child eats nothing but hotdogs. So, the HTDGS option gets a weight of 100 with respect to proteins. CNDY is a zero in this respect, and the balanced diet has to fall somewhere between the best and the worst, so you give it a value of 50. At this point, you have the first row in a table of options versus benefits:

	<u>HTDGS</u>	<u>CNDY</u>	<u>OTHERSTUFF</u>
Proteins	100	0	50
Calories	?	?	?
Vitamins	?	?	?

Now you go to the second row. Which of the three options provides the most calories? Probably CNDY, with HTDGS a close second--so you score them as 100 and 90. The option of OTHERSTUFF is a clear third, with a low value of, say, 20. Filling out the third row in the same way, you wind up with a complete table:

	<u>HTDGS</u>	<u>CNDY</u>	<u>OTHERSTUFF</u>
Proteins	100	0	50
Calories	90	100	20
Vitamins	0	0	100

Now the computer takes over. It calculates a weighted average score for each option. Working with the weights you specified--a value 33 each for proteins, calories, and vitamins--the machine scores HTDGS as $(100) * (33) + (90) * (33) + 0 * 33 = 6270$.

The OTHERSTUFF comes in second with a score of 5610, while CNDY finishes last with a value of 3300.

You have now proven the scientific merit of hotdogs. Q.E.D.

Question 2: Wait a minute. Why did the hotdogs win?

Background on Question 2: Common sense suggests that a good diet should consist of proteins and calories and vitamins. However, the IHTF decision model doesn't see it that way. Within the framework of the model, the total failure of an option to satisfy a requirement does not disqualify the option. The option of HTDGS remains in the running, even though it provides no vitamins. To allow for common sense in this respect, you need another model.

Question 3: *Can't we fix the model so that the balanced diet will win?*

Background on Question 3: Certainly. The numbers can be rigged in several ways. The most obvious choice is to look at the OTHERSTUFF column, which represents the balanced diet, and just set all the numbers in that column at 100 (or whatever the maximum happens to be). This looks a bit fishy in the context of the diet problem; but in the problem that the EXCOM will be working with, who is to say that the "current organization" option does not deserve a 100 on all counts, in relation to the other options?

A second fix is the possibility of adding a new row to the table. This row could be called "nutritional content," so that the balanced diet would win on that row. That might be enough to push the balanced diet into first place. If not, other rows can be added as appropriate.

The third option is to change the weights. Here you simply assume that vitamins are vastly more important than proteins and calories.

The common thread among all these fixes is that they are designed to overcome a basic flaw in the structure of the model.

Question 4: *What about "sensitivity analysis?" Won't that help?*

Background on Question 4: The idea of sensitivity analysis is pretty simple. Let's go back to the step where the weights of 33 were assigned to the different benefits. It is clear that if we gradually increase the weight on vitamins, eventually the balanced diet will win--assuming that we do not change the proportions among the other weights. So, the computer can be set to increase the weight by just enough to make the balanced diet a winner. This is called sensitivity analysis. Therefore, the argument goes, you really do not have to know exactly what the weights should be for the various benefits. After all, even if you were to change several weights, the final decision might not change. So, not to worry. Just write down your initial impressions, and we will let the computer do the rest.

The catch here is that you may be uncertain about more than one of the weights. Suppose that we are working with the 18 "decision factors" outlined by the IHTF. Suppose that the weight associated with each factor can take on one of two values. This is a pretty slim range for each weight; but even so, you are now talking about 262,144 combinations of weights, to say nothing of the different combinations of table values that you might want to try. The computer program for the IHTF model does not begin to

look at all the options. What it does is to vary one weight, holding the proportions among the other weights constant. This is different from allowing the weights to vary simultaneously.

In summary, the simulation option is very limited. It is a fine tool if it manages to resolve an argument over parameters, by showing that the argument makes no difference. But it is no substitute for knowing the right parameter values.

Question 5: *What is a better methodology?*

Background on Question 5: A far better approach is a cost-minimization model. In this case, you begin by specifying the objectives you want to accomplish. These can be broad or narrow, as you wish. One objective might be the goal of providing a certain turn-around time for running one of OER's reservoir engineering models.

Given the goals, you then attempt to think of options for meeting all the goals. These options involve aspects of information handling, and they should also involve other resource considerations, such as the number of hours analysts spend in working with cumbersome programming languages, and the number of secretaries we would need without word-processing systems.

Having selected the options, you choose the cheapest one.

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